



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,197	02/09/2004	Kia Silverbrook	MTB29US	8277

24011 7590 08/01/2006

SILVERBROOK RESEARCH PTY LTD
393 DARLING STREET
BALMAIN, NSW 2041
AUSTRALIA

EXAMINER

CHOI, HAN S

ART UNIT	PAPER NUMBER
----------	--------------

2853

DATE MAILED: 08/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/773,197

Applicant(s)

SILVERBROOK, KIA

Examiner

Han S. Choi

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 6/8/06.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 5-8, 10-14, 16, 18, 19, 23-27, 29-33, 35, 37, 38, 42-44, 46-50, 52, and 54 is/are rejected.
- 7) ☒ Claim(s) 2-4, 9, 15, 17, 20-22, 28, 34, 36, 39-41, 45, 51 and 53 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 6/8/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Terminal Disclaimer

1. The terminal disclaimer filed on 6/8/06 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of USSN 10/773192 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Arguments

2. Applicant's arguments with respect to claims 1-54 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's assumption that the Examiner intended to cite co-pending USSN 10/773192 for the double patenting rejection is correct.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 5, 11-13, 19, 23, 24, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104).

Referring to claims 1, 5, 19, 23, and 24, Keil et al. discloses the basic elements of the claimed invention. Keil et al. teaches a plurality of nozzles [18] in [Col. 3, Lines 31-35] shown in Fig. 1. Keil et al. teaches each nozzle [18] defining a nozzle aperture with a nozzle axis extending through the center of the nozzle aperture and normal to the nozzle aperture (any nozzle aperture will have a normal nozzle axis extending through the center of the nozzle aperture) shown in Fig. 2. Keil et al. teaches a bubble forming chamber corresponding to each of the nozzles [18] respectively in [Col. 3, Lines 56-58] and [Col. 4, Lines 1-3] shown in Fig. 2. Keil et al. teaches at least one heater element [34] disposed in each of the bubble forming chambers [36] respectively, the heater element [34] configured for thermal contact with a bubble forming liquid in [Col. 4, lines 1-3] shown in Fig. 2. Keil et al. teaches the heater element [34] having two planes of symmetry intersecting along the nozzle axis (the heater element [34] has a shape of a rectangle, therefore two intersecting planes of symmetry can be drawn orthogonal to each other). Keil et al. teaches the bubble forming liquid being vaporized which means at a temperature at or above the boiling point of the bubble forming liquid to cause the ejection of a drop of an ejectable liquid through the nozzle [18] corresponding to that heater element [34] in [Col. 4, Lines 25-30], but does not specifically teach heating the heater element to a temperature above the boiling point of the bubble forming liquid. Referring to claims 11 and 30, Keil et al. teaches the bubble overlapping both sides of the heater in Fig. 3. Referring to claims 12 and 31, Keil et al. teaches the gas bubble collapsing to a collapse point spaced from the heater element [34] in [Col. 4, Lines 48-56] shown in Figs. 3-5. Referring to claims 13 and 32, a method of forming a structure

incorporating nozzles by chemical vapor deposition (CVD) does not limit the apparatus structure in this case.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to heat the heater element to a temperature above the boiling point of the bubble forming liquid for the purpose of ensuring that the ink vaporizes each time.

5. Claims 6 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) as applied to claims 1, 5, 11-13, 19, 23, 24, and 30-32 above, and further in view of Pan (US Pat. 4,894,664).

Keil et al. discloses the basic elements of the claimed invention except for the printhead configured to be a page-width printhead.

Pan teaches the printhead configured as a page-width array in the abstract.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Pan with the printhead of Keil et al. for the purpose of concurrent printing of the whole width of the page.

6. Claims 7, 16, 26, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) as applied to claims 1, 5, 11-13, 19, 23, 24, and 30-32 above, and further in view of Chan (US Pat. 5,710,070).

Keil et al. discloses the basic elements of the claimed invention except for a heater element formed of solid material of which more than 90% of which, by atomic

proportion, is constituted by at least one periodic element having an atomic number below 50 and the heater element predominantly formed by titanium nitride.

Chan teaches a thermal inkjet printhead comprising a resistive layer composed of titanium nitride, which forms a resistor and a contact metal barrier layer in [Col. 2, Lines 10-14]. Titanium has an atomic number less than 50 on the periodic table.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the titanium nitride resistor to the printhead of Keil et al. for the purpose of having resistors that are more reliable, especially at higher temperatures and less complicated to manufacture in [Col. 2, Lines 1-2].

7. Claims 8 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) as applied to claims 1, 5, 11-13, 19, 23, 24, and 30-32 above, and further in view of Silverbrook (US Pat. 5,841,452).

Keil et al. discloses the basic elements of the claimed invention except for the heater element configured such that an actuation energy of less than 500 nanojoules is required to heat the heater element sufficiently to form a bubble to cause the ejection of a drop.

Silverbrook ('452) teaches that reducing heater energy reduces power dissipation without affecting print speed, and that typically 200 nanojoules is required to eject a drop by heating the heater element in [Col. 18, Lines 15-18].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a heating element heated to a heating energy of

200 nanojoules in the printhead of Keil et al. for the purpose of maintaining print speed while reducing power dissipation.

8. Claims 10 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) as applied to claims 1, 5, 11-13, 19, 23, 24, and 30-32 above, and further in view of Feinn et al. (US Pat. 6,543,879).

Keil et al. discloses the basic elements of the claimed invention except for a nozzle density greater than 10000 nozzles/cm².

Feinn et al. teaches in [Col. 2, Lines 1-14] a nozzle packing density of at least 100 nozzles/mm² or 10000 nozzles/cm² when converted to square centimeters.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the printhead of Keil et al. with a nozzle density above 10000 nozzles/cm² for the purpose of accommodating higher printing resolutions and to improve the printhead drop generation rate in [Col. 1, Lines 57-61].

9. Claims 18 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) as applied to claims 1, 5, 11-13, 19, 23, 24, and 30-32 above, and further in view of Kubby (US Pat. 5,706,041).

Keil et al. disclose the basic elements of the claimed invention except the heater element substantially covered by a conformal protective coating, all sides of the coating being seamless.

Kubby teaches a heater element [20a or 20b] that is substantially covered by a protective coating substantially to all sides, which are seamless in [Col. 4, Lines 32-50] shown in Fig. 4.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the elements taught by Kubby to the printhead of Keil et al. for the purpose of protecting the heater.

10. Claims 14 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) as applied to claims 1, 5, 11-13, 19, 23, 24, and 30-32 above, and further in view of Kashino et al. (US Pat. 5,534,898).

Keil et al. disclose the basic elements of the claimed invention except for a nozzle plate of the printhead having a thickness of less than 10 microns.

Kashino et al. teaches a thickness of an orifice plate in the order of several microns in [Col. 6, Lines 34-41].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the thickness of the Kashino et al. nozzle plate to the Keil et al. printhead for the purpose of obtaining adequate values of the velocity of the discharged ink droplets, amount of ink droplet and refilling frequency, and in consideration of the distance between the thermal energy generating element and the discharge port in [Col. 6, Lines 35-37].

11. Claims 38, 42, 47, 48, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191).

Referring to claims 38 and 42, Keil et al. discloses the basic elements of the claimed invention. Keil et al. teaches a plurality of nozzles [18] in [Col. 3, Lines 31-35] shown in Fig. 1. Keil et al. teaches each nozzle [18] defining a nozzle aperture with a nozzle axis extending through the center of the nozzle aperture and normal to the nozzle aperture (any nozzle aperture will have a normal nozzle axis extending through the center of the nozzle aperture) shown in Fig. 2. Keil et al. teaches a bubble forming chamber corresponding to each of the nozzles [18] respectively in [Col. 3, Lines 56-58] and [Col. 4, Lines 1-3] shown in Fig. 2. Keil et al. teaches at least one heater element [34] disposed in each of the bubble forming chambers [36] respectively, the heater element [34] configured for thermal contact with a bubble forming liquid in [Col. 4, lines 1-3] shown in Fig. 2. Keil et al. teaches the heater element [34] having two planes of symmetry intersecting along the nozzle axis (the heater element [34] has a shape of a rectangle, therefore two intersecting planes of symmetry can be drawn orthogonal to each other). Keil et al. teaches the bubble forming liquid being vaporized which means at a temperature at or above the boiling point of the bubble forming liquid to cause the ejection of a drop of an ejectable liquid through the nozzle [18] corresponding to that heater element [34] in [Col. 4, Lines 25-30], but does not specifically teach heating the heater element to a temperature above the boiling point of the bubble forming liquid. Referring to claim 47, Keil et al. teaches the bubble overlapping both sides of the heater

in Fig. 3. Referring to claim 48, Keil et al. teaches the gas bubble collapsing to a collapse point spaced from the heater element [34] in [Col. 4, Lines 48-56] shown in Figs. 3-5. Referring to claims 50, a method of forming a structure incorporating nozzles by chemical vapor deposition (CVD) does not limit the apparatus structure in this case. Referring to claim 38, Keil et al. does not teach supplying the nozzle with a replacement volume of the ejectable liquid equivalent to the ejected drop.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to heat the heater element to a temperature above the boiling point of the bubble forming liquid for the purpose of ensuring that the ink vaporizes each time.

Fukuchi et al. teaches replacing an amount equal in volume to the ink that was ejected from the nozzles in [Col. 1, Lines 35-38].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teaching of Fukuchi et al. with the printhead of Keil et al. for the purpose of preventing ink degeneration in the pressure chamber in [Col. 3, Lines 51-58].

12. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191) as applied to claims 38, 42, 47, 48, and 50 above, and further in view of Pan (US Pat. 4,894,664).

Keil et al. in view of Fukuchi et al. discloses the basic elements of the claimed invention except for the printhead configured to be a page-width printhead.

Pan teaches the printhead configured as a page-width array in the abstract.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the teachings of Pan with the printhead of Keil et al. in view of Fukuchi et al. for the purpose of concurrent printing of the whole width of the page.

13. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191) as applied to claims 38, 42, 47, 48, and 50 above, and further in view of Chan (US Pat. 5,710,070).

Keil et al. in view of Fukuchi et al. discloses the basic elements of the claimed invention except for a heater element formed of solid material of which more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 and the heater element predominantly formed by titanium nitride.

Chan teaches a thermal inkjet printhead comprising a resistive layer composed of titanium nitride, which forms a resistor and a contact metal barrier layer in [Col. 2, Lines 10-14]. Titanium has an atomic number less than 50 on the periodic table.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the titanium nitride resistor to the printhead of Keil et al. in view of Fukuchi et al. for the purpose of having resistors that are more reliable, especially at higher temperatures and less complicated to manufacture in [Col. 2, Lines 1-2].

14. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191) as applied to claims 38, 42, 47, 48, and 50 above, and further in view of Silverbrook (US Pat. 5,841,452).

Keil et al. in view of Fukuchi et al. discloses the basic elements of the claimed invention except for the heater element configured such that an actuation energy of less than 500 nanojoules is required to heat the heater element sufficiently to form a bubble to cause the ejection of a drop.

Silverbrook ('452) teaches that reducing heater energy reduces power dissipation without affecting print speed, and that typically 200 nanojoules is required to eject a drop by heating the heater element in [Col. 18, Lines 15-18].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a heating element heated to a heating energy of 200 nanojoules in the printhead of Keil et al. in view of Fukuchi et al. for the purpose of maintaining print speed while reducing power dissipation.

15. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191) as applied to claims 38, 42, 47, 48, and 50 above, and further in view of Feinn et al. (US Pat. 6,543,879).

Keil et al. in view of Fukuchi et al. discloses the basic elements of the claimed invention except for a nozzle density greater than 10000 nozzles/cm².

Feinn et al. teaches in [Col. 2, Lines 1-14] a nozzle packing density of at least 100 nozzles/mm² or 10000 nozzles/cm² when converted to square centimeters.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the printhead of Keil et al. in view of Fukuchi et al. with a nozzle density above 10000 nozzles/cm² for the purpose of accommodating higher printing resolutions and to improve the printhead drop generation rate in [Col. 1, Lines 57-61].

16. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191) as applied to claims 38, 42, 47, 48, and 50 above, and further in view of Kubby (US Pat. 5,706,041).

Keil et al. in view of Fukuchi et al. disclose the basic elements of the claimed invention except the heater element substantially covered by a conformal protective coating, all sides of the coating being seamless.

Kubby teaches a heater element [20a or 20b] that is substantially covered by a protective coating substantially to all sides, which are seamless in [Col. 4, Lines 32-50] shown in Fig. 4.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the elements taught by Kubby to the printhead of Keil et al. in view of Fukuchi et al. for the purpose of protecting the heater.

17. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Keil et al. (US Pat. 6,447,104) in view of Fukuchi et al. (US Pat. 4,549,191) as applied to claims 38, 42, 47, 48, and 50 above, and further in view of Kashino et al. (US Pat. 5,534,898).

Keil et al. in view of Fukuchi et al. disclose the basic elements of the claimed invention except for a nozzle plate of the printhead having a thickness of less than 10 microns.

Kashino et al. teaches a thickness of an orifice plate in the order of several microns in [Col. 6, Lines 34-41].

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the thickness of the Kashino et al. nozzle plate to the Keil et al. in view of Fukuchi et al. printhead for the purpose of obtaining adequate values of the velocity of the discharged ink droplets, amount of ink droplet and refilling frequency, and in consideration of the distance between the thermal energy generating element and the discharge port in [Col. 6, Lines 35-37].

Allowable Subject Matter

18. Claims 2-4, 9, 15, 17, 20-22, 28, 34, 36, 39-41, 45, 51, and 53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

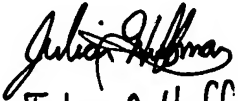
Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Han S. Choi whose telephone number is (571) 272-8350. The examiner can normally be reached on Monday - Friday, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HSC
7/11/06


Julian D. Huffman
Art Unit 2853
20 July 2006